Full spectrum cascade plots

The full spectrum is based on the rotor vibrational data from two XY transducers. The Fourier transformation splits the original waveforms into frequency components. Each mono-frequency component represents an elliptical orbit (in particular, it can be a circle or a straight line). From classical mathematics, it is known that an ellipse can be described as a locus of the vectorial sum of two vectors counter-rotating at a constant frequency. An elliptical orbit is, therefore, a sum of two circular orbits, one rotating forward, one rotating in reverse. In the right half plane, the full spectrum plot presents the amplitudes of the forward rotating orbits of all frequency elliptical components. In the left half-plane, the full spectrum plot presents the amplitudes of the reverse rotating orbits.

If the orbit of a particular frequency component is circular, it will appear on the spectrum, either in the right plane (if the orbit is forward) or in the left plane (if it is reverse). Elliptical orbits will always result in frequency components in both sides of the plane. Their relative magnitudes, however, immediately indicate the orbital motion direction. If the right-side component is larger, the elliptical orbit is forward. If the left-side component is larger, the orbit is reverse. If they are the same, the orbit is a straight line.■